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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/815,919	03/23/2001	Mark L. Jenson	1327.003US1	6195

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LEMAIRE PATENT LAW FIRM, PLLC
P.O. BOX 11358
ST. PAUL, MN 55111

EXAMINER	
BELL, BRUCE F	

ART UNIT	PAPER NUMBER
1746	

DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/815,919	JENSON, MARK L.	
	Examin r	Art Unit	
	Bruce F. Bell	1746	

-- The MAILING DATE of this communication appears on th cover she t with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-78 and 89-117* is/are pending in the application.

4a) Of the above claim(s) *35-64,89-100 and 117* is/are withdrawn from consideration.

5)☒ Claim(s) *65-78 and 101-107* is/are allowed.

6)☒ Claim(s) *1-34 and 108-116* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 December 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 9/20/04
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's have argued the election/restriction imposed by the previous examiner. In view of the applicant's arguments claims 108-115 have been included in this office action.

Claims 35-64 and 89-100 remain withdrawn and new claim 117 is also withdrawn with respect to the claim being drawn to the same subject matter as those withdrawn originally by original presentation.

Claims 1-34, 65-78, 101-116 remain as being addressed in this current office action.

The rejection of claim 25 under 35 USC 112 has been dropped by the examiner in view of the applicant's arguments with respect to the depositing of the material layers.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-34, 115, 116 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is vague and indefinite with respect to how the first layer can be deposited on the substrate and then energized ions be supplied of a second material to assist in growth of the crystalline structure of the film layer "during " the deposition of the first layer, if the first layer has already been deposited. Does applicant mean that the first layer is being deposited and the energized ions are being supplied, simultaneously? If so, then the instant claims should reflect this aspect of the invention.

Claim 18 is vague and indefinite with respect to "the" primary material. There is no antecedent basis for this phrase.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-15, 18, 19, 25-34, 108-115 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,645,656) in combination with Muffoletto et al (6599580) and Allen et al (6077621).

Chen et al discloses a thin film solid oxide fuel cell formed by depositing a thin film electrolyte on a surface of a metal foil that is used as the substrate and then forming a cathode on the electrolyte by known film deposition techniques. See abstract. The substrate or anode is a nickel metal foil onto which the electrolyte is grown by epitaxial growth, so that the crystallography is ordered. See col. 2, lines 13-15. The thin film oxide electrolyte layer can be formed by sputtering, electron-beam evaporation, CVD, molecular beam epitaxy or other oxide film deposition techniques. See col. 2, lines 21-32. The cathode can be deposited by know oxide

film deposition techniques. See col. 2, lines 42-50. The nickel foil can be treated to expose an atomically ordered surface by Ion Beam Assisted Deposition (IBAD). The atomically ordered surface of the nickel foil allows for growth of an atomically ordered electrolyte layer as well as subsequent layers such as the cathode and even the conducting interconnect layers that act as a substrate. See col. 4, lines 5-9. The electrolyte film oxide layer is deposited on the substrate/anode and is typically YSZ. Pure hydrogen or a forming gas can be introduced into the deposition chamber to reduce oxidation of the nickel or other metal substrate under any of the oxide thin film growth techniques. See col. 4, line 10-18. A cathode thin film of LSCO is deposited over the YSZ and can be deposited under conditions which form an atomically ordered film. See col. 5, lines 16-18 and 34-40.

The prior art of Chen et al does not disclose a separate substrate be used in the method of fabricating the solid state energy storage device.

Muffoletto et al disclose a method for improving electrical conductivity of a substrate of metal, metal alloy or metal oxide by directing a high energy beam onto the substrate to cause an intermixing of the deposited material with the oxide of the substrate metal or metal alloy. The step of depositing can be carried out by ion beam assisted deposition, electron beam deposition, CVD, or PVD. The high energy beam can be an ion beam from a high energy ion source and the deposition may be performed on either a treated or untreated substrate. The substrate with the oxide layer and metal layer is used as the electrode in devices

like batteries and capacitors. See abstract. The ion beam which carries out the mixing of the metal with the oxide, includes Argon, Xenon, and Krypton ions. The advantage of the ion beam mixing is the precise control of mixing concentration and depth it provides, since the ion beam current can be measured accurately during bombardment, and tight control over ion energies are obtained. See col. 3, lines 43-54. The energy level of an ion beam of argon used in the deposition of the metal to be mixed with the substrate is shown to be about 200 ke V. See example 1.

Allen et al discloses the use of a dual beam process for providing an ion conducting membrane with a thin metal or metal oxide film by depositing the metal or metal oxide by a high energy electron beam of ions. See abstract. The deposition process uses a low energy beam to clean the membrane surface and then a high energy electron beam containing metal ions to form a thin metal film on the membrane. See col. 4, lines 16-23. The dual ion beam assisted deposition uses vacuum and temperature control, and combines vapor deposition with simultaneous ion beam bombardment. The vapor deposition is initiated via electron beam evaporation of the source and the evaporated species along with two ion-beams converge on the substrate to deposit the metal on the substrate. Low energy beams are typically argon and high energy beams are oxygen or nitrogen and the evaporated species is platinum, iridium, gold, tantalum, tungsten, silver, zinc, iron, copper, nickel, etc.. The concurrent ion stitching densifies the film formed and improves the adherence between the film and the

substrate. The use of concurrent ion beams allows one to construct adherent films of highly controlled porosity, depth, and ion composition on a variety of materials. See col. 4, lines 32-58. The films formed are used in membrane electrode assemblies or as gas diffusion electrodes. See col. 4, lines 62-67. The energy levels of the high and low power ion beams are from 500 –2000 eV and 100-500 eV, respectively. See col. 5, lines 35-39. The IBAD has been used to coat ion conducting membranes, and create electrode and membrane structures having great film adhesion and interface control. See col. 5, lines 40-43.

The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the instant invention was made because even though the prior art of Chen et al does not disclose the use of a substrate in the making of the solid state energy device, Muffoletto et al shows that a substrate may be used in the making of an electrode for use in batteries or capacitors. Further, even though Chen et al does not teach the substrate, Chen does disclose that the anode is a substrate and one having ordinary skill in the art would know that these types of devices can have a separate substrate with anode attached or that the anode can act as the substrate. It appears from the Chen et al patent that the method of making an energy storage device is known but that the method of depositing a first layer and supplying energized ions to the first layer simultaneously is not taught, however, the patent to Allen et al shows that this technique is known to those having ordinary skill in the art and that this deposition method is used to more precisely control the porosity (density) and

depth of the film and at the same time yield a highly adhesive film to the substrate on which it is being attached. Therefore, it appears that one having ordinary skill in the art would have the knowledge to either use a substrate to deposit the thin film or deposit the thin film onto a combination substrate/anode and to use the dual beam deposition process as set forth in Allen et al for the purpose of improving the film deposition, by gaining more precise control of the deposition and to greatly increase the film's adhesion to the layer or substrate being used in the making of the energy storage device. Applicant's instant method appears to be laying the materials down in an opposite direction to that of the Chen et al patent, however, the order in which the materials are deposited is considered obvious in view of the final product having the same structure. The substrate being used in the above processes appears to be met by virtue of the same or similar materials being used in the method of making the energy storage device as can be seen by the patents to Chen et al in combination with Muffoletto et al and Allen et al. The apparatus of claims 108-115 has been met for the same reasons as set forth in the method of fabricating since all the features of the apparatus means plus function have been found in the prior art combination. The recitation is claim 115 with respect to the energy storage device being a lithium battery is met by virtue of the Chen et al patent which shows the LSCO cathode. Even though the Chen et al patent discloses that it is a fuel cell, the fuel cell is also known in the art to be called a lithium metal-air battery. Therefore, the Chen et al patent renders this aspect of the invention as being obvious.

Applicant's will probably state that the Chen et al patent is irrelevant since the filing date is the same as that of applicant's provisional application 60/191774, however, the examiner has reviewed this provisional application and can not find any specifics to the method of fabricating an energy storage device in the manner as set forth in the instant claims and therefore, the use of the Chen et al patent is proper.

Therefore, the prior art of Chen et al in combination with Muffoletto et al and Allen et al renders the applicant's instant invention obvious for the reasons set forth above.

Allowable Subject Matter

2. Claims 16, 17, 20-24, 65-78, 101-107 and 116 are allowable over the prior art of record.

3. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record fails to teach and/or suggest contact layers on the substrate which partially separates the first layer from the substrate. Deposition of intercalating layers having the crystallite sizes set forth in the claims is also not taught or suggested. The method of fabricating by forming seed film on the substrate prior to depositing a first film and supplying a material different from the first material adjacent to the first material to control growth of a crystalline structure on the first material and next depositing an electrolyte and third film layer respectively, is also not taught or suggested. The method of fabrication the solid state energy storage device as set forth

in the claims and additionally performing cryogenic annealing after assembly is also not taught or suggested.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bruce F. Bell whose telephone number is 571-272-1296. The examiner can normally be reached on Monday-Friday 6:30 AM - 3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on 571 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BFB
December 27, 2004

Bruce F. Bell
Primary Examiner
Art Unit 1746